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NOTES ON GEOGRAPHIC DISTRIBUTION

Dryophylax chaquensis (Bergna & Álvarez, 1993) (Serpentes, Colubridae): first record from Cochabamba Department and a geographic range extension in Bolivia

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Abstract. We present novel distributional information on the little-known snake species *Dryophylax chaquensis* (Bergna & Álvarez, 1993) in Bolivia, including the first record from Cochabamba Department. Our record extends the distribution of this species towards the Bolivian Inter-Andean Dry Forests by approximately 63 km to the west (in a straight line) from the nearest known locality in Vallegrande, Santa Cruz, Bolivia. We comment on the biogeographic distribution, altitude of occurrence, and aspects behavior and natural history of *D. chaquensis* in Bolivia.

Key words. Biogeographic distribution, Inter-Andean Dry Forests, Pasorapa, snake

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INTRODUCTION

Dryophylax chaquensis (Bergna & Álvarez, 1993) was described from the Chaco region of Argentina, with the type locality in Colonia Las Mercedes, San Fernando Department, Chaco, Argentina. Its current distributional range includes northern Argentina, southern and eastern Bolivia, southwestern Brazil, Paraguay, and Uruguay (Wallach et al. 2014; Nogueira et al. 2019; Trevine et al. 2021). It occurs in the Chaco, Pantanal, Cerrado, the Andean grasslands and pampas, with most records coming from the Chaco and Pantanal ecoregions (Nogueira et al. 2019).

In Bolivia, *D. chaquensis* has been reported from the departments of Santa Cruz (Jansen 2008; Trevine et al. 2021) and Tarija (Lavilla and Scrocchi 1999; Trevine et al. 2021). The geographic distribution includes the Flooded Savannas (Pantanal region), the Inter-Andean Dry Forests in Santa Cruz, and the Tucuman-Bolivian Forest in Tarija (Nogueira et al. 2019; Trevine et al. 2021). However, little information on *D. chaquensis* exists in the scientific literature, likely a result of the limited amount of research that has historically occurred in Bolivia.

Dryophylax chaquensis has nocturnal and semi-arboreal habits (Alves and Albuquerque 2017). The diet has been recorded to consist exclusively of anurans, the genera *Leptodactylus* Fitzinger, 1826, *Boana* Gray, 1825, and *Elachistocleis* Parker, 1927 (Dorado-Rodrigues et al. 2012; Alves and Albuquerque 2017; Carrillo 2017; Dias-Silva et al. 2021; Cavalheri et al. 2023). However, information on the natural history of this species is scarce and limited throughout its natural geographic range.

Here we report the first record of *D. chaquensis* from the department of Cochabamba, expanding its geographic distribution to include central Bolivia and the Inter-Andean Dry Forests.

METHODS

In 2014, we found a specimen of *Dryophylax chaquensis* during the herpetological evaluation in the Inter-Andean Dry Forests of the town of Pasorapa, Cochabamba, Bolivia (Figure 1). The specimen was collected following the sample preparation protocol (euthanasia, fixed, and preservation) described by Cacciali

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Figure 1. Landscape of Inter-Andean Dry Forests of Pasorapa, Cochabamba, Bolivia. Altitude 2147 m above sea level.

(2013) and was deposited in the herpetological collection of the Museo de Historia Natural Alcide d'Orbigny (**MHNC-R**), Cochabamba, Bolivia.

Scale counts, scutellation, and terminology followed Dowling (1951) and Peters (1964). Head-scale counts (i.e. loreal, preocular, postocular, supralabials, infralabials, and temporal) are reported for the right side only. Dorsal scale-row counts were taken at three standardized locations: head length behind occiput, midbody, and head length anterior to cloaca; these are separated by a hyphen (-). Ventral, subcaudal (single row counting) and cloacal scale counts. We used a Bausch and Lomb (0.7*–3×) Stereomicroscope with a digital camera Canon 80D (105 mm) to visualize the length of the keel in the dorsal scales and to verify the presence or absence of apical pits. We obtained measurements of snout–vent length (SVL) and tail length (TL) in millimeters (mm) using a flexible tape measure. Sex was determined by injection of the subcaudal region following the methodology outlined by Simmons (2002). The specimen was identified through comparison with the original description of the species (Bergna and Álvarez 1993) and other contributions (Akmetins et al. 2010; Franco et al. 2017; Trevine et al. 2021).

We obtained exact geographic coordinates in decimal degrees using a Garmin eTrex GPS receiver using the WGS84 datum. The distribution map of the species for Bolivia was prepared using ArcGIS software (ArcMap v. 10.2), including previous records and new records of *D. chaquensis* from the Inter-Andean Dry Forests of Cochabamba.

RESULTS

***Dryophylax chaquensis* (Bergna & Álvarez, 1993)**
Figures 2, 3

New record. BOLIVIA – Cochabamba • Campero province, Pasorapa municipality, banks of a seasonal stream in Inter-Andean Dry Forests, ca. 2147 m elev. (Figure 2); −18.3233, −064.6828; 22.III.2014; L.R. Rivas and G. Callapa leg.; 10:59 h, 1♀, on rock, sunbathing, MHNC-R 3001 (Figure 3).

Identification. Meristic characters: the specimen (MHNC-R 3001) is characterized by having 19-19-15 dorsal scales, dorsal scales keeled (15 rows), but not very marked and keels do not reach the apex, 146 ventral scales, 54 subcaudal scales (paired), an undivided cloacal scale, 1 loreal, 1 preocular, 2 postoculars, 8 supralabials, 9 infralabials, 2+3 temporals, fourth and fifth supralabial contact the orbit, the first five infralabials contact the first pairs of chin-shields, fifth infralabial contact the second pairs of chin-shields. SVL = 370 mm; TL = 92 mm (Table 1).

Coloration pattern: top of head brown, with gray-brown spots on all scales; transverse spot on the anterior half of the frontal and supraoculars; a larger, more compact spot extending to the posterior region of the frontal, supraoculars and the entire parietal (Figure 3A, B). Lateral gray-brown band, starting from the nasals, crossing the orbit towards the commissure of the labials, and extending diffusely for approximately

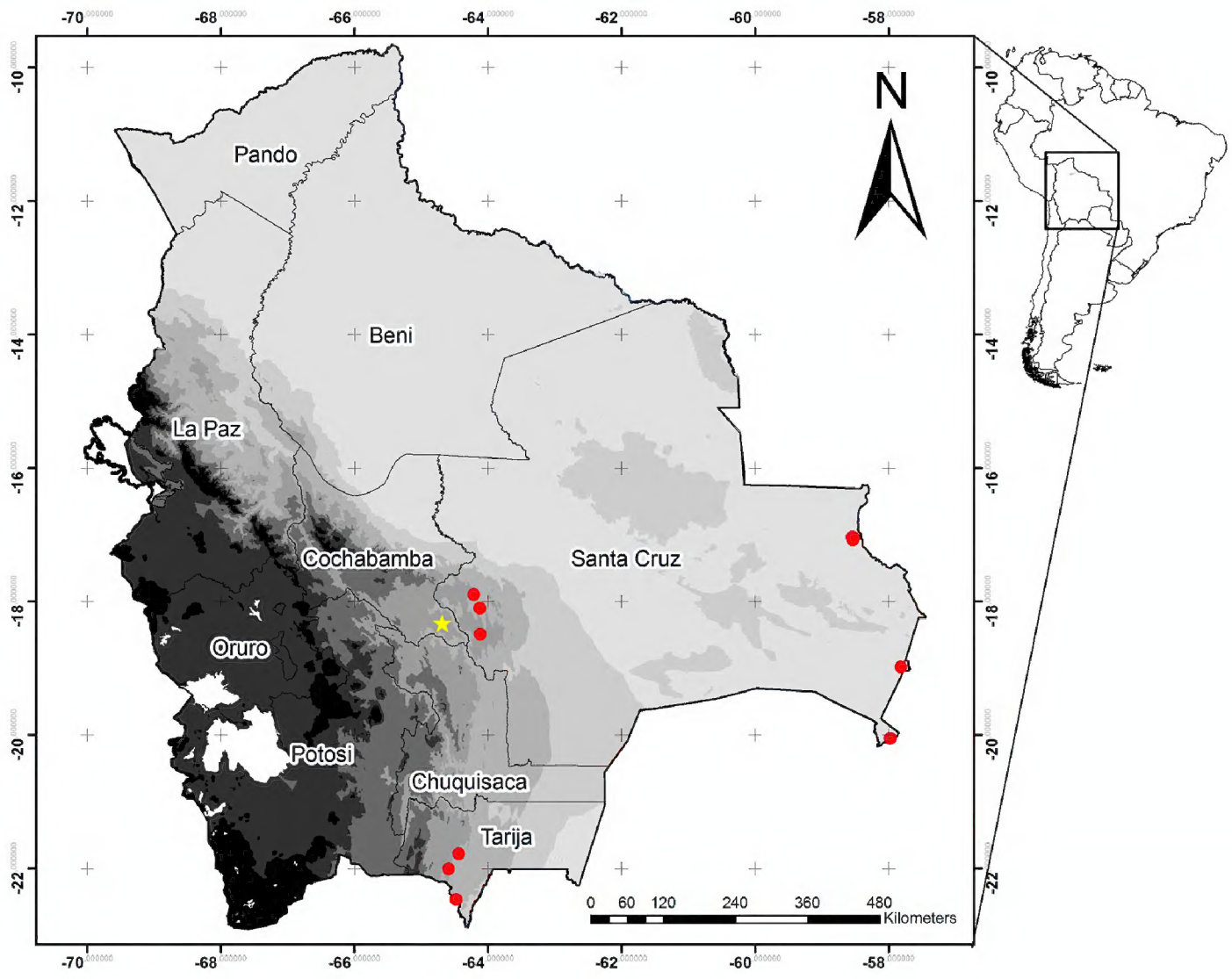

Figure 2. Range distribution of *Dryophylax chaquensis* in Bolivia and distribution range extension for the Cochabamba Department, Bolivia. Previous records (red points) and first record for the Cochabamba Department (yellow star – this study).

Figure 3. Adult female of *Dryophylax chaquensis* (MHNC-R 3001) of Pasorapa, Cochabamba, Bolivia. **A.** Dorsal view of the snake in life. **B.** Dorsal view of the head in preserved. **C.** Ventral view in preserved.

four rows of scales backwards. Two long, dark spots separated by a light vertebral band in the nuchal region; mottled brown, with clear rounded dark spots arranged in pairs on both sides of body, in a non-continuous band made up of conspicuous light spots extending to tip of tail; diffuse gray-brown band laterally on each side of body (Figure 3A). Light ventral region mottled with gray, forming transverse and longitudinal

Table 1. Meristic and scutellation characters of *Dryophylax chaquensis* specimen (MHNC-R 3001) from Pasorapa, Cochabamba, Bolivia, compared with the data presented by Bergna and Álvarez (1993), Akmetins et al. (2010), Franco et al. (2017), and Trevine et al. (2021). Snout–vent length (SVL), tail length (TL), supralabials (SL), infralabials (IL), male (M), female (F), mean ($\bar{x}$), maximum (Max), no data (–).

	MHNC-R 3001	**Bergna and Álvarez 1993**	**Akmetins et al. 2010**	**Franco et al. 2017**		**Trevine et al. 2021**	
Sex	F	M and F	F	M	F	M	F
SVL	370	435 ($\bar{x}$)	396	577 (Max)	501 (Max)	577 (Max)	501 (Max)
TL	92	108 ($\bar{x}$)	103	–	–	233 (Max)	197 (Max)
Dorsals	19-19-15	19-19-15	19-19-15	19-19-15	19-19-15	19-19-15	19-19-15
Ventrals	146	137-156	143	136-152	135-155	136-152	135-155
Subcaudals	54	49-74	58	55-73	48-65	55-72	48-65
Cloacal	Undivided	Divided	–	–	–	–	–
Loreal	1	1	1	–	–	–	–
Preocular	1	1	1	–	–	–	–
Postocular	2	2	2	–	–	–	–
Temporal	2+3	2+3	2+3	–	–	–	–
SL	8	8	8	8	8	–	–
SL contact orbit	4-5	4-5	–	–	–	–	–
IL	9	9	9	9	9	–	–
IL contact first pairs of chin-shields	1–5	–	1–5	–	–	–	–
IL contact second pairs of chin-shields	5	–	–	–	–	–	–

series (Figure 3C).

The morphometric, meristic characters, and color pattern is congruent with the original description of *D. chaquensis* by Bergna and Álvarez (1993), and with descriptions by Akmetins et al. (2010), Franco et al. (2017), and Trevine et al. (2021). However, our Cochabamba specimen differs from the holotype in having an undivided cloacal scale; this scale is divided in the holotype.

DISCUSSION

Trevine et al. (2021) recently reported several occurrences of *D. chaquensis* in Bolivia (half without specific location), including three specimens from the Inter-Andean Dry Forests of the department of Santa Cruz (Florida and Vallegrande provinces). The record of *D. chaquensis* from Pasorapa constitutes the first record of the species for Cochabamba Department, and we extended the biogeographic distribution range by approximately 63 km to the west (in a straight line) from the closest point (Vallegrande) in the Bolivian Inter-Andean Dry Forests. This ecoregion is among the most vulnerable in Bolivia, due to agricultural and livestock expansion, and the expansion of urban areas (Ibisch et al. 2003; Mendoza-Miranda et al. 2023).

Dryophylax chaquensis occurs in a wide altitudinal gradient, from 2 m (Ensenada, Buenos Aires, Argentina) to 2080 m above sea level (Volcán, Jujuy, Argentina) (Akmetins et al. 2010; Trevine et al. 2021). Reports of the species for Bolivia do not exceed 2025 m above sea level (Vallegrande, Santa Cruz, Bolivia) (Trevine et al. 2021). Our specimen from Pasorapa, Cochabamba was found at an altitude of 2147 m in the South American Andean foothills, which represents the highest record of the species.

Bellini et al. (2014), Alves and Albuquerque (2017), Dias-Silva et al. (2021), and Cavalheri et al. (2023), in their publications on the diet of *D. chaquensis* in the Brazilian Pantanal, indicated that the species is nocturnal, terrestrial, and semi-arboreal. However, the Pasorapa specimen was found extended during the day, sunbathing on a rock, confirming that the species also has diurnal and terrestrial habits. It is probable that populations of this snake from the west of the Andean foothills may present more diurnal habits, once the change in temperatures in these areas is abrupt, hot during the day (>30 °C) and cold at night (<0 °C) (Ibisch et al. 2003; Mendoza-Miranda et al. 2023). Dorado-Rodrigues et al. (2012), Alves and Albuquerque (2017), Carrillo (2017), Dias-Silva et al. (2021), and Cavalheri et al. (2023) reported some species of anurans of the families Hylidae, Leptodactylidae and Microhylidae in the diet of *D. chaquensis*. In Pasorapa, we did not have any record of the diet of *D. chaquensis*; however, it is known to coexist with *Boana riojana* (Koslowsky, 1895), *Rhinella arenarum* (Hensel, 1867), and *Pleurodema cinereum* Cope, 1878, as well as other reptiles (*Tropidurus azurduyae* Carvalho, Rivas, Céspedes & Rodrigues, 2018, and *Bothrops* cf. *diporus* Cope, 1862).

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ADDITIONAL INFORMATION

Conflict of interest
The authors declare that no competing interests exist.

Ethical statement
No ethical statement is reported.

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Author contributions
Conceptualization: LRR, CBE, RLP, GC, PMM, AM. Data curation: LRR, GC. Formal analysis: LRR, GC. Funding acquisition: LRR, AM. Investigation: LRR, GC. Methodology: LRR, GC. Visualization LRR, GC. Project administration: LRR, AM. Writing – original draft: LRR. Writing – review and editing: LRR, CBE, RLP, GC, PMM, AM.

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Data availability
All data that support the findings of this study are available in the main text.

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